Moving to Ensembles and Probabilistic Data: Ensuring Forecasters Are Ready

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NATIONAL WEATHER SERVICE

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Acknowledgements / Co-authors

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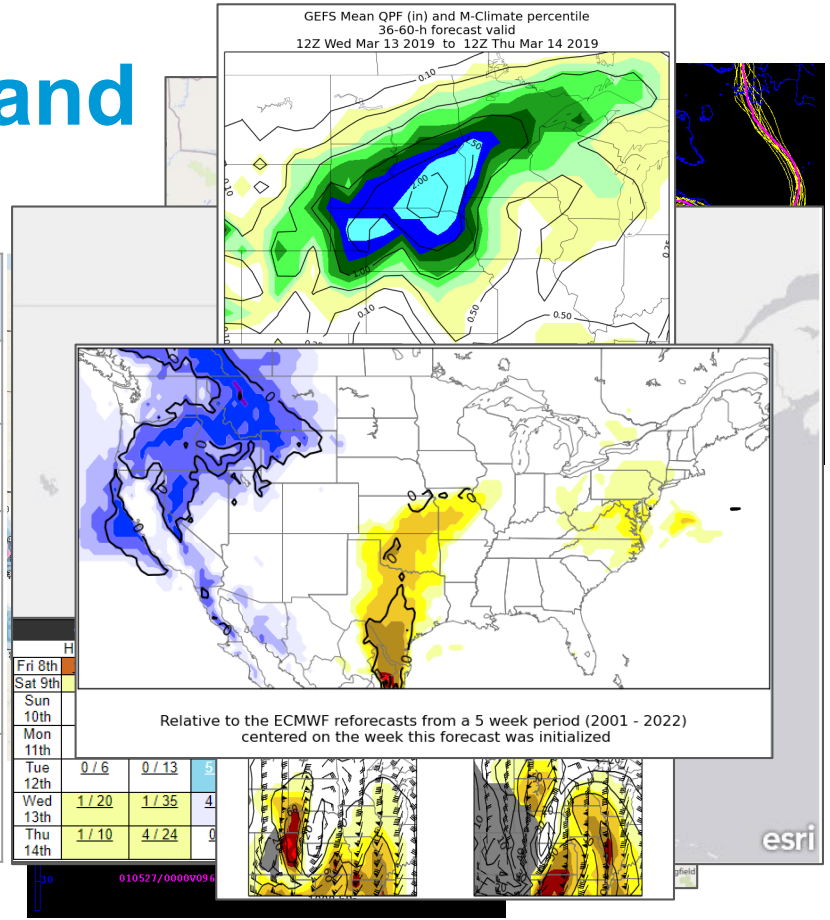
…and the entire Ensemble Fluency Training Team!

Evolution of Ensembles and Visualization Tools

	2000	2024
Global Members	10	100-150
Resolution	200 km	9-25 km
Post-Processing	Spread, Spaghetti Plots	NBM, Anomalies, M-Climate, EFI, SoT, Reforecasts, Records Info
CAMS	None	HRRR-E, HREF, WoFS



Challenges NWS Forecasters Face

- Primary forecast delivery vehicle is single value / deterministic driven, e.g. NDFD, Point and click forecasts
- Due to increasing file size, cannot deliver ensemble data to AWIPS where forecast production occurs
  - File size also impacts training on past data
- Traditionally forecasters have focused on deterministic NWP

However, Social Science is Clear:

People make better decisions, have higher trust in information, and/or display a greater understanding of forecast information when shown a [tailored] probabilistic forecast instead of a deterministic one

(Ripberger, et al, 2022)

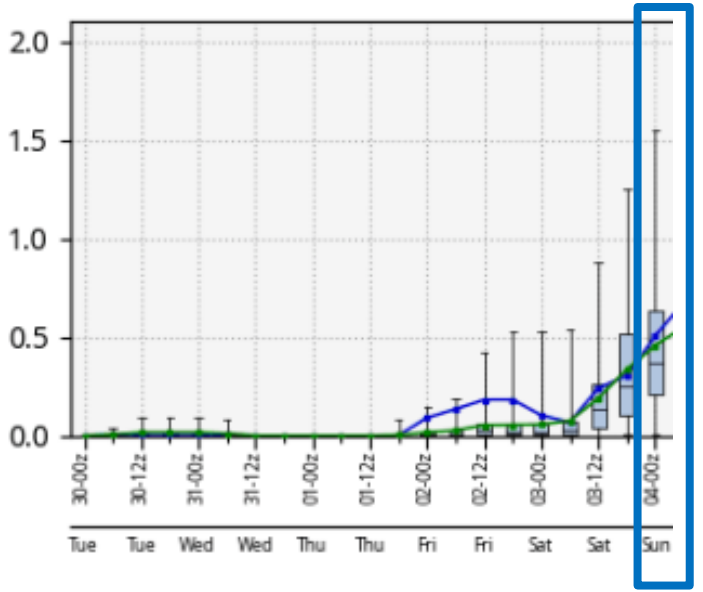
So how do we help forecasters move in this direction? Training!

“Pop Quiz”

What distribution matches the highlighted QPF forecast at right?

A) Gaussian
B) Bi-modal
C) Gamma
D) None of the above

24 hour QPF forecast for Kansas City, MO
ECMWF 00Z 2024 Jan 30 cycle



Answer: C) Gamma

24 hour QPF forecast for Kansas City, MO
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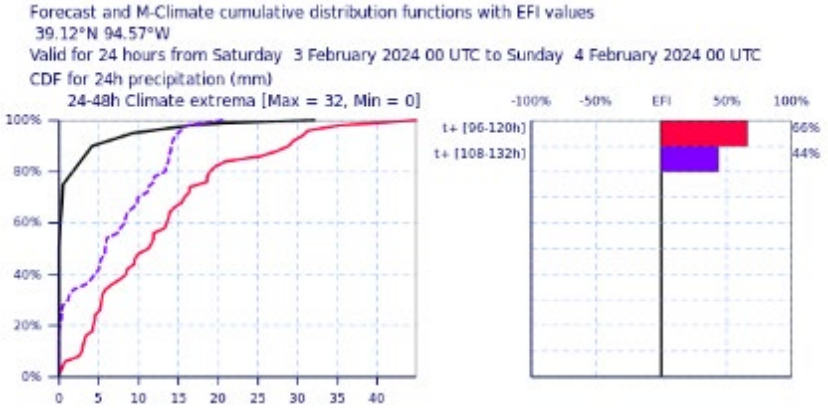
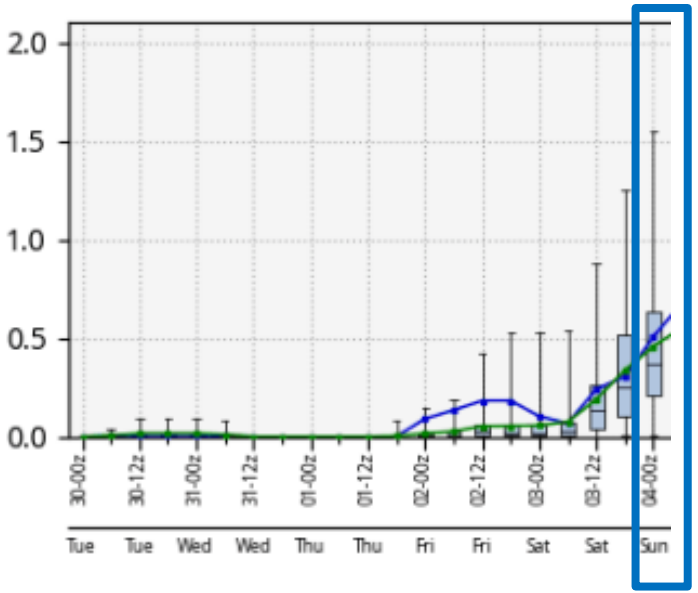
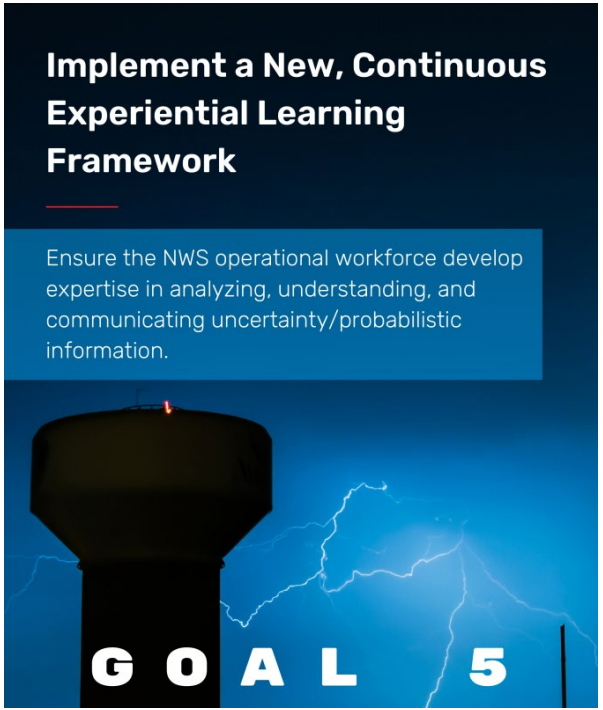




Ensemble Fluency Training

- Born out of NWS's "Ken's 10" Probabilistic IDSS Initiative
- Goal: Ensure forecasters are fluent in both analyzing and contextualizing ensemble and probabilistic data
- Team formed to create training for all forecasters, with representation across NWS and COMET



Prob IDSS Roadmap

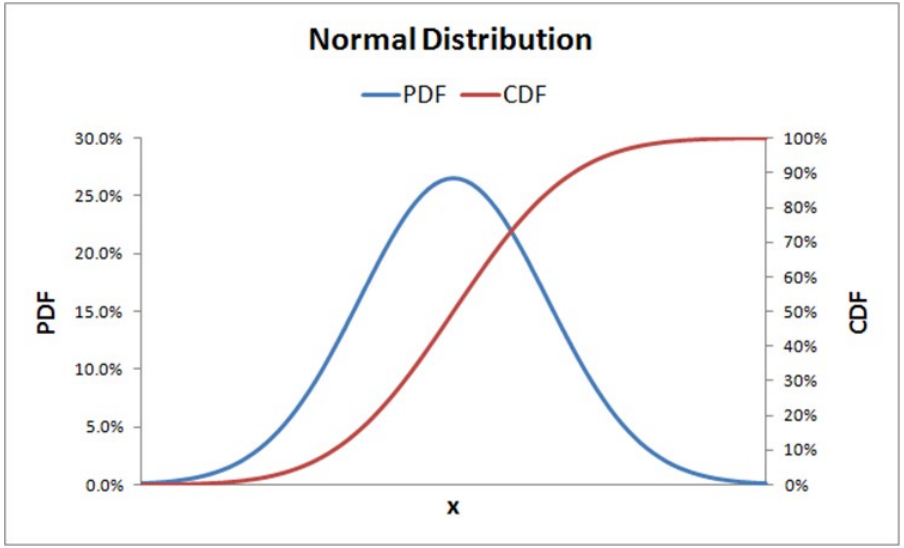
High Level Overview

Pre-Test

- Goal: able to test out of sections of the training if you are already proficient
- After student completes, the office's training officer will:
  - Receive the results
  - Assign training for the student based on the pre-test results
  - Brief the student on areas of training to focus on

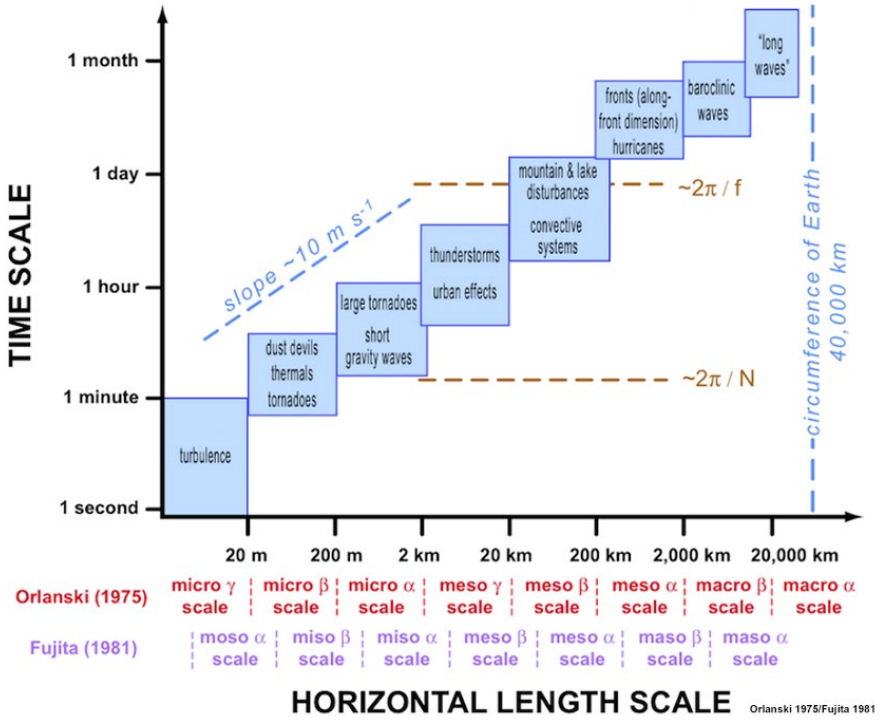
Statistics and Probability Review

- PDF/CDF & Histograms
- Mean & Median
- Distributions: Gaussian, Gamma, Bimodal, Multimodal
- Percentile and Probability Measures
- ARI
- M-Climate vs R-Climate



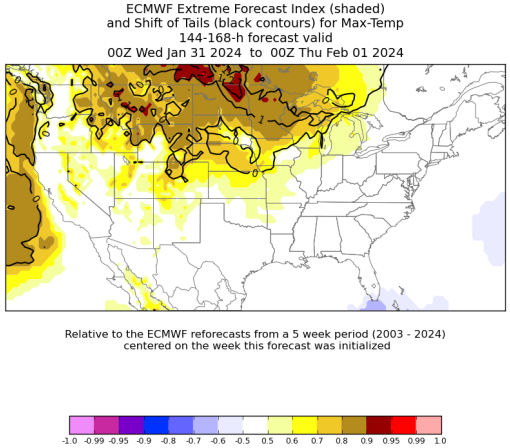
Resolvability

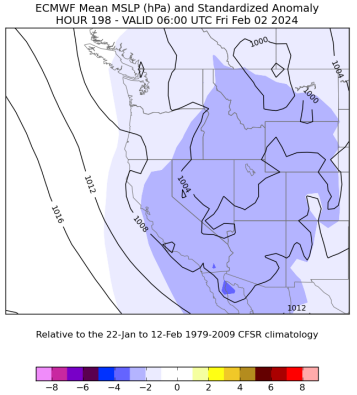
- Grid spacing vs resolution
- Predictability changing with time
- Model blending and mixing resolvability
- Ensemble size

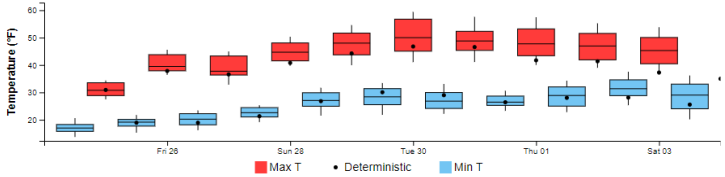


Tools and Visualization

- Ensemble Mean and Spread
- Standardized Anomaly
- Box & Whisker
- Spaghetti & Paintball plots
- Extreme Forecast Index / Shift of Tails
- Plumes
- Trajectories & Tracks
- Cluster Analysis







When Is The Training Available?

NWS Forecasters will receive the training during the first quarter of CY 2024

I'm not in the NWS, can I access the training?

No, but a lot (> 75%) of the training will link to COMET training which is available to all. Monitor the "MetEd" site for the course: https://meted.ucar.edu/education_training/courses/118

References and Questions

Ripberger, J., Bell, A., Fox, A., Forney, A., Livingston, W., Gaddie, C., Silva, C., & Jenkins-Smith, H. (2022). Communicating Probability Information in Weather Forecasts: Findings and Recommendations from a Living Systematic Review of the Research Literature, *Weather, Climate, and Society*, *14*(2), 481-498. Retrieved Jan 6, 2023, from https://journals.ametsoc.org/view/journals/wcas/14/2/WCAS-D-21-0034.1.xml

Be sure to also visit *Poster E79: Ensemble Fluency - The Foundation for Future Probabilistic Training* on Wed Jan 31 at 3 pm

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